

**SOUTHEAST ALASKA BIOMASS-TO-ETHANOL
PROJECT
FEEDSTOCK SUPPLY PLAN
FINAL REPORT**

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EXECUTIVE SUMMARY

Sealaska Corporation has been working with the Alaska Energy Authority and the National Renewable Energy Laboratory (NREL) to evaluate the feasibility of designing, constructing and operating a regional biomass-to-ethanol manufacturing facility in Southeast Alaska. NREL contracted with TSS Consultants for a comprehensive re-assessment of availability and delivered cost of feedstock in Southeast Alaska.

OBJECTIVE

The objective of this assessment is to provide a Feedstock Supply Plan based upon the availability of wood residues from logging, thinning and sawmills in Southeast Alaska as well as sawmill residues in British Columbia. The plan will determine the feedstock availability and costs, identify the available infrastructure for collecting, processing, storing and transporting the required feedstock, assess competition for feedstock and, determine the air pollution emission offset credits that could be generated as a result of using available biomass.

FINDINGS

TSS reviewed timber harvesting operations on Sealaska timberlands, evaluated Sealaska log sort yards, visited the Southeast Alaska sawmills and made a site visit to Prince Rupert, British Columbia. TSS also reviewed timber inventory data and future timber harvest plans from Sealaska and assessed past and future timber harvest data and precommercial thinning activity and plans from the Tongass National Forest. The following table reflects a summary of TSS's findings of total feedstock availability.

Summary of Feedstock Availability for Southeast Alaska

Feedstock Source	Estimated Annual BDT
Sealaska Timber Harvest/Thinning Residue	150,000 – 170,000
Tongass Timber Harvest/Thinning Residue	200,000
SE Alaska Sort Yards	32,500 – 37,500
SE Alaska Sawmills	99,625 – 120,125
British Columbia Residue	35,000 – 197,500
Total	517,125 – 725,125

TSS recommends the following feedstock supply plan, providing 100,000 bone dry tons (BDT) of residue on an annual basis for a facility located at Klawock at a cost of approximately \$12.50/BDT.

Estimated Feedstock Cost and Mix for Klawock Site

Feedstock Source	Estimated BDT/Year	Estimated Cost/BDT
Sawmill Residue	50,000	\$12.20
Sort Yard Residue	25,000	\$8.75
B.C. Sawmill Residue	25,000	\$16.90
Total	100,000	\$12.51

RISKS**Feedstock Risks**

- Increased Federal and State environmental regulation could further limit timber harvest on Federal and private lands, reducing the availability of residue generated from sawmills and log sort yards in Southeast Alaska.
- Transportation is the major component of feedstock cost for this project. Increases in the cost of fuel can impact the effective costs of feedstock.
- There is a risk that the amount of chloride present in a portion of the feedstock will cause problems with the ethanol process.
- Unforeseen competition for the planned feedstock in the future could increase feedstock costs.

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INTRODUCTION

Sealaska Corporation has been working with the Alaska Energy Authority and the National Renewable Energy Laboratory (NREL) to evaluate the feasibility of designing, constructing and operating a regional biomass-to-ethanol manufacturing facility in Southeast Alaska. The Southeast Alaska timber industry has experienced a significant accumulation of wood residues generated from logging and other wood manufacturing operations throughout Southeast Alaska. Current disposal practices such as open burning and landfilling, as well as simply leaving unmerchantable material in the woods is not the best use of these forest resources.

NREL contracted with TSS Consultants for a comprehensive re-assessment of availability and delivered cost of feedstock in Southeast Alaska. This assessment provides a Feedstock Supply Plan based upon the availability of wood from logging and thinning operations on Sealaska Corporation property on Prince of Wales Island and other private lands in the area and the availability of wood residue from sawmills in the area. In addition, the potential availability of wood residues from the Tongass National Forest and British Columbia were evaluated as a source of feedstock for a biomass to ethanol project.

The study area includes the Sealaska Corporation property on Prince of Wales Island consisting of nearly 300,000 acres and the Tongass National Forest consisting of nearly 17 million acres.

OBJECTIVE

The objective of the Feedstock Supply Plan is to:

- determine the feedstock availability and costs.
- identify the available infrastructure for collecting, processing, storing and transporting the required feedstock
- assess competition for feedstock and,

- determine the air pollution emission offset credits that could be generated as a result of using available biomass.

FINDINGS

During the course of developing this Feedstock Supply Plan, TSS reviewed timber harvesting operations on Sealaska timberlands, evaluated Sealaska log sort yards, visited the Southeastern Alaska sawmills and made a site visit to Prince Rupert, British Columbia. TSS also reviewed timber inventory data and future timber harvest plans from Sealaska and assessed past and future timber harvest data and precommercial thinning activity and plans from the Tongass National Forest.

- TSS concluded that some available sources of feedstock supply are uneconomic for this project, such as the collection and processing of precommercial thinnings and the collection and processing of logging residue left after logging.
- TSS also found that although many changes have occurred within the Southeast Alaska sawmills, such as closures and changes of ownership, that there appears to be an adequate supply of biomass available to support the development of a biomass-to-ethanol facility.
- TSS estimates that 100,000 bone dry tons (BDT) of residue is available on an annual basis for a facility located at Klawock at a cost of approximately \$12.50/BDT.
- The following Table 1.1 reflects a summary of TSS findings of feedstock availability.

Table 1.1 Summary of Feedstock Availability for Southeast Alaska

Feedstock Source	Estimated Annual BDT
Sealaska Timber Harvest/Thinning Residue	150,000 – 170,000
Tongass Timber Harvest/Thinning Residue	200,000
SE Alaska Sort Yards	32,500 – 37,500
SE Alaska Sawmills	99,625 – 120,125
British Columbia Residue	35,000 – 197,500
Total	517,125 – 725,125

PRIVATE TIMBERLAND FEEDSTOCK

Sealaska Timberlands

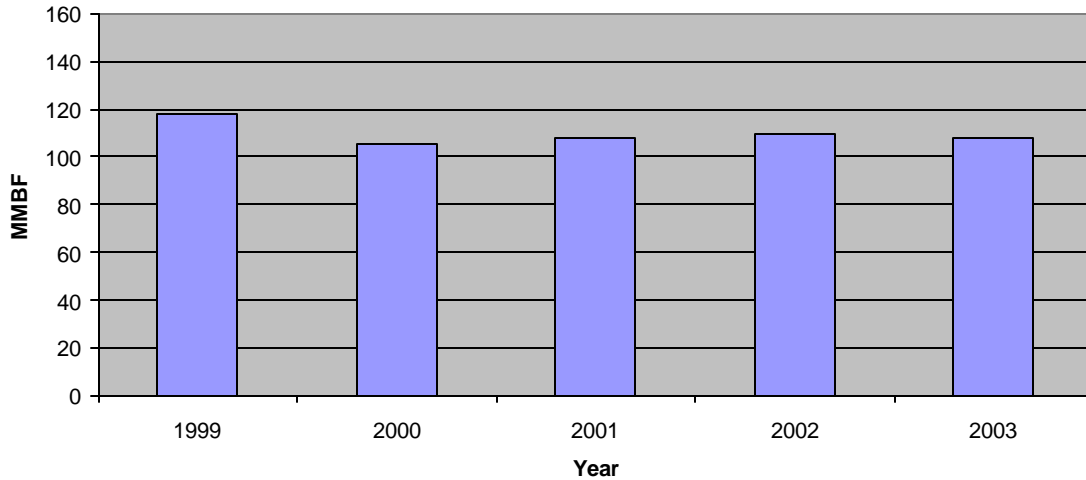
Sealaska owns the majority of private timberlands in Southeast Alaska. Historically Sealaska harvests approximately 4,000 acres per year from their nearly 300,000 acre holdings. The majority of the timber harvested from Sealaska timberlands is exported in log form. Sealaska has sold logs into the Far East market for the past twenty years. The log export markets are more competitive today than ten to twenty years ago.

In addition to Sealaska timberlands, there are several small ownerships and Native Village Corporation ownerships. There are no other large corporate ownerships in Southeast Alaska. Discussions with the Alaska Division of Forestry indicated that Sealaska is the only major private landowner in Southeast Alaska managing their timberlands for Sustained Yield. Sustained Yield has become an issue with major environmental groups.

Sealaska Logging Residue

TSS reviewed Sealaska Corporation Forest Lands Inventory data by geographic location and by individual tax block on a confidential basis. Approximately 75 percent of Sealaska's unharvested timberlands are located in the mid to southern region of Prince of Wales Island. TSS has also reviewed Sealaska's current five-year harvest plan as submitted to the State of Alaska Division of Forestry. This review indicates that the acres harvested could range from 4,500 to 5,000 acres per year in the future. TSS reviewed timber harvesting operations on Prince of Wales Island to determine the availability of residues from logging and thinning on Sealaska timberlands.

The following Figure 1.1 provides a review of Sealaska's five-year timber harvest plan as submitted to the Department of Natural Resources, Division of Forestry. This plan reflects the harvest of both sawlogs and pulp volume for the period. According to Sealaska, in the long term these harvest volumes may be reduced by as much as 10 percent. However, since Sealaska has not reached full land entitlement, the harvest volumes could remain the same or increase.

Figure 1.1**Sealaska Planned Timber Harvest Volume (MMBF)**

TSS found that Sealaska was removing the majority of the material from the land. Logs that may have been left in the woods in the past are now being utilized for veneer and for pulp. In many cases what remains is material that is being used to provide a base for equipment to walk on during shovel logging to prevent soil damage. Over time the remaining logging residue will deteriorate, returning nutrients to the soil. Based upon this review of current logging operations, TSS estimates that 0.65 BDT of residue remains after logging for each MBF of timber harvested. Using this average for Sealaska lands, TSS estimates that between 50,000 to 70,000 BDT is available on an annual basis. In the past, when veneer and pulp were not utilized, TSS estimates that approximately 1.0 BDT/MBF of residue remained in the woods after logging.

The following Figure 1.2 is a picture of a shovel logging area on Sealaska's timberlands that was reviewed by TSS in October 1999.

Figure 1.2



TSS estimates that it would cost between \$80 to \$100/BDT to collect, process and deliver logging residue from Sealaska timberlands to the ethanol facility.

The following Figure 1.3 reflects a cable logging unit within the same area. The current use of veneer and pulp logs improves the utilization of available fiber.

Figure 1.3



TSS has made the following estimate of logging residue availability on an annual basis from Sealaska timberlands. This estimate is based upon TSS's experience with biomass collection from timber harvesting operations, Sealaska timber inventory data and Sealaska's five-year harvest plan.

The following Table 1.2 reflects a range of timber harvest residue that will be generated from Sealaska's timberlands by tax block.

Table 1.2 Estimated Sealaska Timber Harvest Residue By Tax Block

Tax Block	2000 (BDT)	2001 (BDT)	2002 (BDT)	2003 (BDT)
Hoona	9,000 – 13,000	12,000 – 16,000	12,000 – 16,000	10,500 – 16,000
Kake	8,500 – 11,500	10,000 – 14,000	10,000 – 14,000	10,000 – 14,000
Craig/Klawock	11,000 – 14,500	11,000 – 14,500	0	0
Kasaan	9,500 – 11,500	9,000 – 10,000	0	0
Hydaburg	7,000 – 9,500	8,500 – 10,000	20,000 – 23,500	20,000 – 22,500
Dall Island	6,000 – 8,000	0	14,500 – 18,000	15,000 – 18,000
Ketchikan	0	5,000 – 6,000	0	0
Total	51,000 – 68,000	55,500 – 70,500	56,500 – 71,500	55,500 – 70,500

Sealaska Thinning Residue

Sealaska is very proactive in thinning their reproductive timber stands that regenerate after timber harvest. TSS witnessed where this was occurring on Prince of Wales Island. The young stands are approximately 12 years old and two to three inches in diameter. The thinning is being done to create spacing needed for increased growth. Hand crews are accomplishing this thinning; with the material cut and left on the ground to deteriorate. TSS estimates that in the long-term that Sealaska could thin the same acreage each year that they are currently harvesting. The past timber harvests on Sealaska timberlands have been at a rate of approximately 4,000 acres per year. Based upon a review of future timber harvest plans and Sealaska timber inventory data, this acreage could range from 4,500 to 5,000 acres per year.

The following Figure 1.4 shows an area of Sealaska timberland that has been recently thinned.

Figure 1.4



Past experience with mechanically gathering this size material indicates that it requires approximately 600 stems to make a load of chips. TSS estimates that approximately 1,200 stems per acre are being cut and would generate approximately 25 BDT per acre. This would amount to approximately 100,000 BDT on an annual basis. However, based upon TSS's experience it is believed that the removal of this material is neither practical nor is it cost effective due to the difficulty in access, the small piece size and the terrain.

Sealaska Sort Yard Residue

Each logging operation has a log sort yard. At these locations substantial volumes of long butts and other material disguard in the process of final log manufacture. This material is potential feedstock for the ethanol project as long as the cost of collection and processing is included in the cost of logging. Sealaska indicate that their current disposal cost is approximately \$3.82/MBF to dispose of residue at their log sort yards. Assuming a log volume of 100,000 to 110,000 MBF per year, they are currently spending nearly \$400,000 per year to dispose of this residue. The

following Figure 1.5 shows an example of the sort yard residue generated from Sealaska timber harvesting.

Figure 1.5



The residue available from Sealaska timber harvesting for this project will be in the form of material such as long butts and unmerchantable logs that become waste, when logs are delivered to sort yards for final merchandizing. Previous studies have estimated that approximately 130 to 150 BDT of sort yard waste is generated for each million board feet of logs that are processed. Using this assumption, and an average annual log harvest volume of approximately 100,000 MBF, a total of 13,000 to 15,000 BDT of Sealaska sort yard waste is generated annually. TSS estimates that during the next five years, approximately 35 to 40 percent of this waste will be generated at the Hoona and Kake log sort yards. The remainder will be generated at the planned central log sort yard in Klawock.

The following Figure 1.6 shows the current sort yard in Klawock and some of the residue that accumulates.

Figure 1.6



Southeast Alaska Log Sort Yards

Gateway Forest Products

TSS contacts with Gateway indicate that they expect to have the same volume of sort yard residue that Sealaska would have since they process approximately the same volume through their sort yard as Sealaska. Therefore, TSS estimates that they also generate between 13,000 and 15,000 BDT of sort yard waste on an annual basis. To reduce contaminates Gateway also intends to pave their sort yard to be able to collect and process all of the waste into a usable form, rather than having to dispose of it.

Seley Corporation

TSS was unsuccessful in contacting Seley directly. From discussions with Southeast Alaska industry representatives, the Seley operations have a significant volume of residue and are currently disposing of residue with a burner at their site in Ketchikan. Gateway estimates that Seley generates approximately 50 percent of the amount of residue that they do. For the purposes of this analysis, TSS estimates that Seley generates approximately 6,500 to 7,500 BDT per year.

The following Table 1.3 reflects a summary of TSS's estimate of the sort yard residues in Southeast Alaska.

Table 1.3 Summary of Sort Yard Residue Availability

Sawmill Owner	Estimated BDT Available
Sealaska	13,000 – 15,000
Gateway Forest Products	13,000 – 15,000
Seley Log & Lumber Ltd.	6,500 – 7,500
Total	32,500 – 37,500

TSS believes that the sort yard owners/operators will collect, process and deliver this residue, FOB barge at no cost to avoid disposing of this residue by burning or landfilling. The cost of the sort yard residue will consist of the cost of barge transportation to the ethanol facility.

Alaska Export Log Program

Historically, Alaska has been a major player in the U.S. log exports to the rest of the world. The following chart reflects the historic log exports between 1988 and 1997. Federal legislation bans the export of logs from all public lands (State and Federal) in the western continental United States. Alaska cannot ship any timber in log form from public lands within its boundaries under the authority of the Organic Act of 1927. However, the purchaser of a National Forest timber sale can apply to the Regional Forester for approval to export logs if the purchaser can prove that the volume is surplus to Alaska demand. It is the intent of the Forest Service to promote local processing of National Forest timber.

The rules for receiving approval to export logs from the Tongass National Forest vary by species. The procedure is as follows:

- Alaska yellow cedar – all is available for export.
- Western red cedar – can apply, but must show the volume is surplus to Alaska demand. This is accomplished by obtaining quotes from three Alaska processors. If no quotes are received, or if quotes would show a loss, the purchaser must get three quotes from the lower 48. If no quotes are received or if the quotes would show a loss, the purchaser can apply to the Regional Forester for a permit to export logs overseas.
- Sitka spruce and Hemlock – can apply, but must show that the volume is surplus to Alaska demand by obtaining quotes from three Alaska processors. If no quotes are received, or if quotes would show a loss, the purchaser can apply to the Regional Forester for a permit to export logs overseas.

In recent history, the volume granted permits for exporting logs have been significant. According to data received from the Tongass National Forest, in CY 1997 a total of 38 MMBF was exported, in CY 1998 a total of 23 MMBF was exported.

Admitted to the Union in 1959, Alaska does not have a long history of log export restrictions; but it has a tumultuous one, given the Alaska Native Claims Settlement Act (ANCSA), and the Ninth Circuit Court of Appeals, which overturned the State statute banning log exports.

Passed by Congress in 1971, ANCSA provided for the transfer of 40 million acres of Federal lands in Alaska to Indians, Eskimos, and Aleuts, to settle aboriginal land claims of the Native peoples. Those lands became private holdings, not under supervision of the Bureau of Indian Affairs. Native timber harvests are not subject to primary processing requirements.

In Southeast Alaska, Alaska Natives received a half-million acres of largely unharvested public timber lands as private owners, mostly in 1979-80, and mostly drawn from National Forests. Log exporting, controversial in Alaska as elsewhere, began at once from these lands. Most Native timber is exported as round logs, and most of Alaska's log exports are from Native-owned private lands. Sealaska has been and expects to continue to export approximately 75 MMBF per year.

Japan is the world's largest importer of raw wood material, but the volume and composition of its imports have changed radically over the last few years. The Japanese processing industries (sawmills, plywood mills and pulpmills) have become less and less competitive compared to larger-scale mills in wood producing regions, which do not have many of the constraints brought about by Japanese high labor costs. Over the 1990's Japanese log (sawlog and veneer log) imports have roughly decreased by one half, from 29 million cubic meters in 1990 to about 15 million cubic meters in 1998. The following Figure 1.7 reflects that historic Alaska log exports for the past ten years.

Figure 1.7



Environmental Issues Facing Private Timberland Owners

Alaska Rainforest Campaign

The Alaska Rainforest Campaign (ARC) is a coalition of groups. The listed member groups are the following:

- Alaska Center for the Environment - Anchorage
- Defenders of Wildlife – Washington, DC
- Earthjustice Legal Defense Fund - Juneau
- Alaska Conservation Foundation - Anchorage

- Natural Resources Defense Council - Olympia
- Sierra Club - Homer
- Southeast Alaska Conservation Council - Juneau
- The Wilderness Society – Anchorage
-

The information available on the Alaska Rainforest Campaign website indicates that logging on private lands may come under from environmentalists. There is concern expressed that the best remaining forest stands in the Alaska rainforest are mostly privately owned, with almost all of these lands in the hands of the Alaska Native corporations, established by Congress in 1971 and unique to Alaska. These lands were selected from the National Forests and are now exempt from many laws that protect public resources.

Sustained-yield management is an issue for the Alaska Rainforest Campaign; an environmentalist group. Sustained yield seeks to assure a steady supply of timber over time, rather than allowing a boom-and-bust cycle of management.

However, because the Alaska Native corporation lands are privately owned, federal sustained-yield laws do not apply. As is noted earlier, Sealaska does manage their lands for sustained yield, however, Sealaska may receive some environmental reaction over this and related issues from the Alaska Rainforest Campaign. As private landowners, the corporations are also not limited in the size of their clearcuts, with the result that entire stands have been shorn of forest in 10-mile long swaths. Native corporations landowners are only required to leave 66-foot “no-cut” buffers along salmon streams, whereas loggers on public lands must leave 100-foot strips. Protection is not required for wildlife habitat.

In the future, Sealaska timberland practices are likely to feel environmental pressure to conform to protection requirements applied to federal lands.

SOUTHEAST ALASKA SAWMILLS

Gateway Forest Products

During 1999, Gateway Forest Products purchased the assets of Ketchikan Paper Corporation, as a subsidiary of Louisiana-Pacific. Gateway is a new corporation made up of former KPC management and other investors. The new company plans to construct a veneer plant at Ward Cove that is expected to be operating in the fall of 2000.

Based upon conversations with Jim Erickson and Dan Benson of Gateway, they estimate that the sawmill presently uses 60 MMBF per year and this will increase somewhat when they start up the veneer plant. Gateway managers project the production of approximately 90,000 to 100,000 green tons (GT) per year of hog fuel. The hog fuel is enclosed under roof and averages 50 percent moisture content (MC). It is currently being shipped to Skeena Cellulose at Prince Rupert and to Georgia Pacific in Bremerton, Washington. The material going to Georgia Pacific (GP) is then brokered to other locations in British Columbia. When the proposed ethanol project starts up, the hog fuel will be available for use as feedstock. Based upon Gateway's estimated GT generation of hog fuel and average moisture content, TSS estimates that Gateway will have available from 45,000 to 50,000 BDT of hog fuel annually for this project. Gateway also indicated that they could backhaul hog fuel from Skeena Cellulose at Prince Rupert with the barges that deliver pulp chips to Skeena. This would provide a significant savings in transportation.

Silver Bay Logging – Wrangell

Dick Buhler of Silver Bay Logging indicated that in 1999 they produced and sold approximately 30,000 bone dry units (BDU's) (one BDU = 2,400 dry pounds) of pulp chips and expects that hog fuel production was about half that amount. Hog fuel is being disposed of by building roads, using as base for an area golf course and using for fill at the airport. Silver Bay intends to increase their production during 2000 by at least 1/3. Log usage and lumber production in 1999 was approximately 20 MMBF. TSS estimates that they will generate approximately 24,000 BDT of hog fuel this year and beyond, subject to log availability and markets for their lumber.

Silver Bay currently has two barge loads of hog fuel ready to ship south. They indicated that the Craig/Klawock area is a very difficult place to get to by barge. They barge logs from there and it takes 20 to 24 hours. Many times the weather requires that they wait. Silver Bay has their own barges and boats for moving chips and hog fuel. They have a 244 foot by 50 foot barge that will haul 900 BDU of pulp chips.

Whitestone Southeast Logging – Hoona

TSS visited with Keith Walker at Whitestone Southeast Logging in Hoona. Keith indicated that their lumber production and log usage were approximately 500 MBF per month, with no overrun. Their hog fuel generation (bark and sawdust) amounts to approximately 100 cubic yards (CY) per day. Whitestone does not have a chipper, they produce slabs and long butts and try to burn everything. He estimates that they burn between 40 and 60 CY per day of slabs, chunks, and long butts. TSS estimates that they generate approximately 3,125 BDT of hog fuel and an additional 1,000 BDT of slabs, chunks and long butts per year.

Seley Corporation – Ketchikan

Dan Benson at Gateway estimated that Seley produces about half of what they do. Seley has a pile of hog fuel and a burner that is used for disposal. TSS estimates that Seley generates in the range of 25,000 to 30,000 BDT of hog fuel per year.

Viking Lumber

TSS visited the Viking Lumber site and met with Kirk Dahlstrom. Viking's current log usage is 24 MMBF, including the sawmill and the chip plant. Viking currently has a 14 MMBF log usage in the sawmill and a 10 MMBF log usage for generating pulp chips annually. He currently chips all logs with a top diameter of 12 inches or smaller.

Mr. Dahlstrom estimates that within a year, Viking's log usage will be 20 MMBF in the sawmill and 10 MMBF for pulp chips annually. Viking plans to install a small log side in the mill to produce studs. They will then utilize logs down to a 5 – 6 inch diameter.

Viking now has a contract for selling his pulp chips and hog fuel. The volumes amount to 42,000 BDT of pulp chips and 6,000 BDU/year of hog fuel. This contract has four more years of term, Viking receives zero for his hog fuel FOB barge. It is apparent that Viking produces more hog fuel than he is able to move to market, with more being produced as the mill expands. It is TSS's opinion that Viking would likely receive more for their pulp chips if the purchaser did not have to absorb the hog fuel. TSS estimates that Viking currently generates 8,500 BDT of hog fuel and should generate approximately 12,000 BDT of hog fuel per year once their production increases.

Viking indicated at the time of our visit that they have approximately 2 years of timber supply under contract, approximately 50 MMBF. This is actually a little more than two years supply, as this year they were able to purchase 14 MMBF of log supply from private sources this year. The following Figure 1.8 shows a pile of hog fuel at the Viking sawmill.

Figure 1.8



The following Table 1.4 reflects a summary of TSS's estimate of the biomass residue available from Southeast Alaska sawmills.

Table 1.4 Summary of Sawmill Residue Availability

Sawmill Owner	Estimated BDT Available
Gateway Forest Products	45,000 – 50,000
Silver Bay Logging	18,000 – 24,000
Whitestone Logging	3,125 – 4,125
Seley Log & Lumber Ltd.	25,000 – 30,000
Viking Lumber	8,500 – 12,000
Total	99,625 – 120,125

Timber supply is key to the survival of sawmills in Southeast Alaska. The following Table 1.5 reflects the Tongass National Forest timber sale volumes that are under contract as of 12/31/99. Timber Data Company in Eugene, Oregon, reports this data. This data shows that the major sawmill owners have significant national forest timber under contract.

Table 1.5 Southeast Alaska Sawmill Operators – National Forest Timber Under Contract

Sawmill Owner	12/31/99 Volume Under Contract MBF
Gateway Forest Products/KPC	99,650
Silver Bay Logging	91,619
Whitestone Logging	11,814
Viking Lumber	64,527
Total	218,317

Other Issues Impacting Sawmill Operators

Lumber Markets

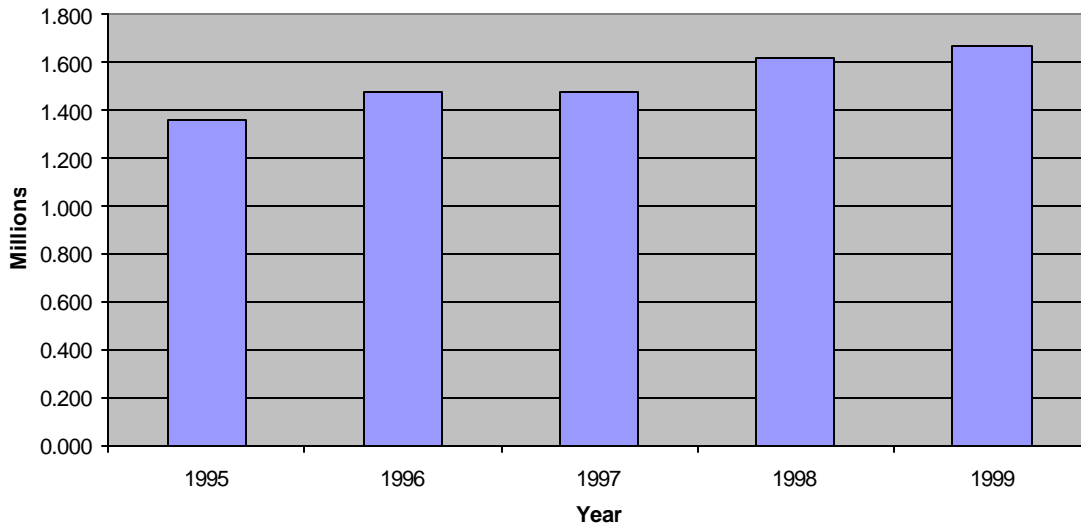
Home building is the largest end-use market for wood products. More new housing units were started in the U.S. in 1999, 1.665 million units, according to the Census Bureau, than any year since 1986. Single-family starts, the segment of the housing market that consumes the most lumber and panels, totaled 1.333 million houses in 1999, more than any year since 1978. The pace of new home construction continued to increase up through the first quarter of 2000. The seasonally adjusted annual rate of total starts averaged 1.718 million units. As of May 2000, the seasonally adjusted annual rate of U.S. housing starts is 1.592 million units. This slowdown is caused in part by increased mortgage interest rates. Thirty-year fixed-rate mortgages averaged 8.15 percent in April. In April 1999, 30-year mortgages averaged 6.92 percent.

The Western Wood Products Association (WWPA) in Portland, Oregon predicts that higher interest rates and lower economic growth will likely end a three-year run of record lumber demand. The WWPA expects that lumber demand in the U.S. will total 52.55 billion board feet in 2000, down 3.3 percent from the previous year. The WWPA also predicts that housing starts will decline to 1.56 million for 2000.

The following Figure 1.9 provides a recent historic review of the U.S. housing starts during the past five years. Although there is a sharp downturn since the high rate in February 2000, housing starts remain exceptionally strong by recent historical standards.

Figure 1.9

Historic U.S. Housing Starts



In addition to a slowdown in the housing starts, industry experts site the reduced demand for lumber in depressed Asian markets has contributed to a big oversupply in the United States. Many exporters have started selling their lumber into the United States, pushing down prices. Random Lengths, a forest products information service based in Eugene, Oregon, reflects a weighted average of 15 key framing lumber products stood at \$311/MBF, down from \$424/MBF a year ago.

Competition for Feedstock and Log Supply

There appears to be no current or future competition for the proposed feedstock for a potential biomass to ethanol facility. The feedstock will be wood waste generated in log sort yards and hog fuel generated by sawmills in Southeast Alaska and British Columbia. These wood wastes are currently a waste disposal problem. Normally a discussion of the other waste wood users within the area relative to the total supply and their impact on the volume and price of the remaining wood waste supply would be sufficient. However, Sealaska's plans to construct and operate a

veneer plant in conjunction with a central log sort yard and ethanol facility significantly add to the complexity of the subject of competition.

Assuming that Gateway Forest Products veneer plant operates as planned, Viking increases their log consumption and that Sealaska installs a veneer plant, log consumption within this area will increase by approximately 50 MMBF. This increase is significant given the history of continued reductions in harvest of timber from the Tongass National Forest. Based upon Sealaska's assessment of the logs that are provided from their timberlands, it would appear that approximately half of this log requirement will be supplied from outside log purchases.

Based upon TSS's investigation of log supply and potential additional demand for logs from the Tongass National Forest and from private lands within the area, it appears that the log supply will become tight and log prices will increase. The purchase of outside logs can be accomplished in several ways. Logs can be obtained from purchasers of National Forest timber sales, logs can be purchased from other private timberland owners or Sealaska can enter into competing for timber sales directly from the Tongass National Forest and market the logs that they can't use.

Gateway Forest Products is a supplier with the potential to provide approximately 50 percent of the feedstock for the ethanol facility and will also be Sealaska's greatest competitor for raw material for the veneer plant. Gateway Forest Products is currently in the process of installing a veneer lathe at their complex at Ward Cove. This facility is reportedly approximately the same capacity as the veneer plant that Sealaska is currently planning to install.

Viking Lumber in Klawock is another potential feedstock supplier with the potential to supply over 10 percent of the feedstock for the ethanol facility and will also be a competitor for raw material for the veneer plant. Viking currently uses the same size and quality of log that Sealaska will be acquiring for its small log milling operation as well as its pulp log processing.

The acquisition of outside purchase logs for the veneer plant and feedstock for the ethanol facility from these competitors will require artful negotiation by Sealaska.

Competition for Product Markets

One of the central issues facing the Alaska forest sector is competitiveness relative to producers in the Pacific Northwest and British Columbia.

A major change has been in the structure of the Alaska forest sector. The permanent closure of one pulp mill in 1993 and the closure of the second Alaska pulp mill in March 1997 changed both the structure and the scale of the forest products industry in southeast Alaska. The loss of local markets for manufacturing residues presents challenges to lumber producers in Alaska. Because revenue from residues is, in some market conditions, the key to profitability, greater dependence on more distant and less certain markets changes the competitive environment for lumber manufacturing in Alaska. Alaska faces diseconomies of small scale and relatively higher handling and transportation costs for chips than mills in the Pacific Northwest.

Although lumber exports to Japan from the Pacific Northwest declined by nearly 40 percent over the period 1989-95, increases in shipments from Canada to Japan more than offset this decline. As a result, from 1990 to 1996, total lumber shipments from North America to Japan increased by nearly 30 percent while shipments from Alaska fell by nearly 90 percent. Steady production in British Columbia and increasing lumber production in eastern Canada have helped to increase Canada's share of both the Japanese and the U.S. market, and to moderate price increases, especially for middle and lower grade lumber.

During the decade of (1987-96), private timber accounted for nearly two-thirds of all timber harvested in Alaska, and more than three-fourths of the private timber harvest occurs in southeast Alaska. Historically, nearly all the private timber harvest was exported in log form. It was assumed that existing Alaska mills either cannot or will not compete for timber harvested from private land (Native Corporations) in Alaska.

NATIONAL FOREST FEEDSTOCK POTENTIAL

Tongass National Forest

The Tongass National Forest is not only the largest National Forest consisting of nearly 17 million acres, it is perceived to be one of the most important. It is an example of remaining temperate coastal rainforest and its well being is of critical interest regionally and nationally. The Tongass stretches 500 miles along the southeastern coast of Alaska, embracing hundreds of islands, majestic mountains, sparkling glaciers, and deep fiords. The Tongass National Forest provides homes for the world's largest concentrations of bald eagles, grizzly bears, and Sitka black-tailed deer.

Salmon spawn in the numerous wild streams, supporting Alaska's healthy and rich commercial and sport fisheries. Eighty percent of the fish caught in Southeast Alaska were spawned and reared in streams on the Tongass National Forest. The Tlingit and Haida Indians have depended on forest resources for thousands of years. Today many Native and non-native people harvest plants, fish, deer, and other wildlife to feed their families and pass on their unique culture.

Intense logging began in the Tongass National Forest in the 1950's when the Forest Service contracted with Ketchikan Pulp Company (KPC), and Alaska Pulp Corporation (APC), giving them 50-year contracts on public timber in exchange for building and operating pulp mills in Ketchikan and Sitka.

However, through continued modifications of the Tongass Land Management Plan the acres designated as suitable for timber harvest are now limited to 576,000 acres. Of this amount, 270,000 acres will be subject to the 200-year timber harvest rotation. The rest remain under the 100-year timber harvest rotation. Southeast Alaska forests are 60 percent western hemlock, 30 percent Sitka spruce and 10 percent cedar.

The following Table 1.6 reflects the comparisons of Tongass Land Management Plan Decisions.

Table 1.6 Comparison of Tongass Land Management Plan Decisions

Component	1979 Plan	1997 Plan	1999 Plan
Average Allowable Sale Quantity	520 MMBF ¹	267 MMBF	187 MMBF
Scheduled for Timber Harvest (100 yr)	1.4 million acres	676,000 acres	576,000 acres
Average Timber Stand Rotation ²	100 years	100 years	100 years ³
Silvicultural System ⁴	Clearcut	Clearcut and Group Selection	Clearcut and Group Selection
Wild, Scenic, and Recreational Rivers	None	32	32 ⁵
Suitable Miles of rivers	None	536	564
Number of river segments	None	31	33

¹ MMBF: Million Board Feet

² Timber Stand Rotation: the number of years allowed for trees to grow to maturity in an area before harvesting again.

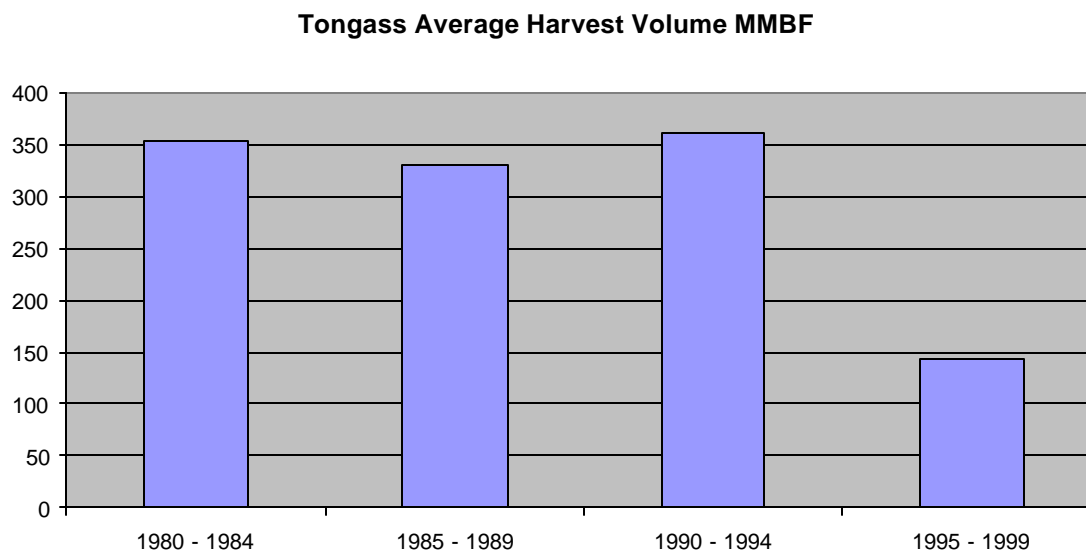
³ A standard and guideline for Sitka black-tailed deer changes the rotation age from 100 to 200 years on 270,000 Wildlife Analysis Areas widely distributed across the forest.

⁴ Silvicultural system: Method used to tend, harvest, and replace forests.

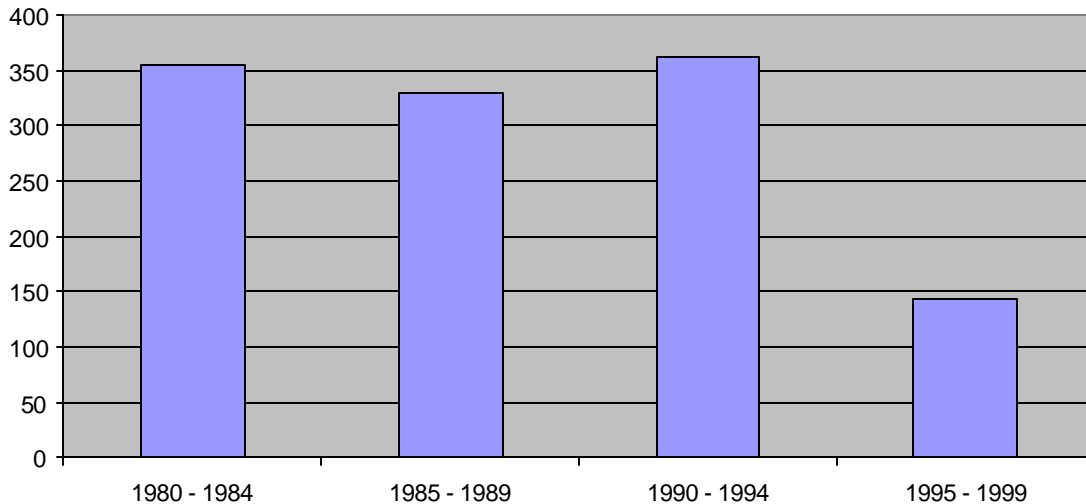
⁵ One river, the South Sullivan River has been referred back to the Regional Forester for additional study.

The following Figure 1.10 reflects the average timber harvest from the Tongass National Forest for the past 20 years.

Figure 1.10



The following Figure 1.11 provides a review of historic timber harvest from the Tongass National Forest by five-year periods from 1980 through 1999. The highest harvest year was in 1980 when 481 MMBF was harvested and the lowest harvest year was in 1997 when 107 MMBF was harvested.

Figure 1.11**Tongass Average Harvest Volume MMBF**

As reflected in the last Tongass Land Management Plan, the Allowable Sale Quantity (ASQ) of sawlog plus utility log will be about 1.87 billion board feet over a ten year period, or 187 million board feet per year. The ASQ is reflected in two components; 153 million board feet are called NIC 1 (non-interchangeable component) – this volume can be harvested using existing logging systems. The remaining 34 million board feet are called NIC 2. These lands can only be harvested using logging systems not commonly used in southeast Alaska; systems, which have significantly higher logging costs. This is a decrease from the 1997 Regional Forester’s Record of Decision, which allowed 267 million board feet annually. However, this is the upper limit of what can be expected to be sold on an annual basis. As noted in Sealaska’s response to the Forest Service regarding the Roadless Initiative dated December 20, 1999, if the roadless initiative is applied to the Tongass National Forest, it could reduce the ASQ to about 50 million board feet. This volume would not meet the needs of local industry, and would have extensive negative effects on the Southeast Alaska regional economy.

It is important to understand that the ASQ is a ceiling; it is not a future sale level projection or target and does not reflect all the factors that may influence future sale levels. For example, the average congressionally funded sale level between 1980 and 1995 was 83 percent of the average

annual ASQ. For the past five years, the funded sale level has averaged 70 percent of the average annual ASQ. Thus, expected actual harvests will be under the Allowable Sale Quantity.

Tongass Logging Residue

The Tongass National Forest has indicated that they intend to sell approximately 125,000 MBF to 130,000 MBF on an annual basis in the southern portion of the forest near the ethanol project. Based on historical trends, TSS believes that the potential clearly exists for this volume to decrease to approximately 100,000 MBF. An opportunity for the ethanol project to obtain residue directly from National Forest timber sales would exist if the logging residue could be removed during the active timber sale.

The Forest Service has decreased utilization standards in order to increase stumpage values on the Tongass. The minimum top diameter of logs that must be removed has been increased from six inches to eight inches.

Based on reviewing the Tongass timber data, TSS believes that approximately 25 percent additional residue is left per MBF harvested on the Tongass National Forest than is left on private timberlands in Southeast Alaska. Using this assumption and the range of projected timber harvest on an annual basis, TSS estimates that approximately 100,000 BDT of logging residue is generated per year on National Forest land near the proposed ethanol project. TSS estimates that the cost of collection, processing and delivery to the ethanol facility would range from \$80 to \$100/BDT, if the ethanol project has to absorb the incremental costs.

Responding to Market Demand for Tongass Timber

In April 2000 Section 101 of the Tongass Timber Reform Act amended the Alaska National Interest Lands Conservation Act (ANILCA;P.L. 96-487) deleting the following provision:

Sec. 705. (a) The Congress authorizes and directs that the Secretary of the Treasury shall make available to the Secretary of Agriculture the sum of at least \$40,000,000 annually or as much as the Secretary of Agriculture finds is necessary to maintain the timber supply from the Tongass

National Forest to dependent industry at a rate of four billion five hundred million board feet measure per decade. Such sums will be drawn from receipts from oil, gas, timber, coal, and other natural resources collected by the Secretary of Agriculture and the Secretary of the Interior notwithstanding and other law providing for the distribution of such receipts: Provided, That such funds shall not be subject to deferral or rescission under the Budget Impoundment and Control Act of 1974, and such funds shall not be subject to annual appropriations.

And inserting:

Sec. 705. (a) Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act (P.L. 94-588); except as provided in subsection 9d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle.

The USDA Forest Service, Region 10 issued a report to address this change.

In the May 1997 Record of Decision (ROD) for the Tongass Land and Resource Management Plan Revision, a commitment was made to “develop procedures to ensure that annual timber sale offerings are consistent with market demand.”

The procedures described here are designed to address the uncertainty associated with forecasting market conditions while the region’s timber industry is undergoing a structural transformation. They also account for the fact that the Forest Service cannot respond quickly to market fluctuations, as it may take several years to prepare timber for offer. The basis approach used in the procedures is to allow the industry to accumulate an adequate “volume under contract” (a supply of uncut volume), then to monitor industry behavior and adjust timber program levels to keep pace with harvest activity.

Although the Tongass National Forest has historically provided the bulk of the timber processed in Southeast Alaska, other entities have occasionally participated in this market as well. The Alaska Native Corporations supplied Alaska’s pulp mills with pulp logs and the State of Alaska maintains a small timber program in the region. Most sawlogs from these non-federal sources

have been exported from the state without processing. However, recent changes in overseas timber markets are forcing a new look at potential domestic uses for some of this timber supply. For instance, the Ketchikan Pulp Company and Sealaska (the Regional Native Corporation) have been studying the feasibility of manufacturing veneer in Southeast Alaska.

In addition to the timber processed in a given year, the annual demand for timber includes the volume needed to build, rebuild, or maintain an adequate “buffer stock” of uncut timber. This backlog of uncut timber is, in essence, the industry’s “dependable timber supply.” A sufficient supply of volume under contract allows the industry to adjust output in response to market conditions. It also appears to play a significant role in the stabilization of regional timber prices. Finally, basic operational considerations underscore the importance of maintaining sufficient timber inventories. For example, after a sale is awarded, it can take an operator one or more years to complete the road construction necessary to gain access to the timber. While this work is underway, the purchaser is harvesting and processing timber purchased in prior years. Consequently, timber processors generally maintain some volume under contract that is carried over from one year to the next.

As the veneer plants and ethanol facility comes online, the Forest Service will consider this additional market demand in planning for and offering timber sales.

US Forest Service Long – Term Contract Opportunities

TSS queried the Deputy Regional Forester, James Caplan and Director of Forest Management, James Bartelme about the opportunity for long – term contracts for feedstock material to support project financing. The maximum National Forest timber sale contract term is limited to 10 years. However, Tongass National Forest contracts are generally not in excess of five-years and most are of shorter term. Those contracts that are longer than two years have price escalation. The Tongass has converted to shorter term contracts to limit speculative bidding that occurred in the past.

The Forest Service believes the opportunity for utilizing feedstock from National Forest timber sales will come from negotiating with timber sale purchasers to remove residue from existing sales. Existing and future contracts provide for optional removal of residue. However, there is

no incentive to do so. The Forest Service has lowered utilization standards (increased minimum top diameters that must be removed) in an attempt to increase stumpage values.

After the ethanol facility is operating, the Forest Service believes that some thinning may be viable. There may also be some opportunities for Stewardship contracts in the future when the glitches get resolved in the lower 48. Right now, the Tongass feels they are not ready for that as they are under staffed and under funded.

US Forest Service Policy for Managing Forest Roads

In October 1999, President Clinton asked the Forest Service to begin an open public process to address how roadless areas within the national forest system would be managed in the future. Roadless areas have typically remained without roads because of inaccessibility, rugged terrain, low timber values, or environmental concerns.

The Forest Service released a notice of intent (NOI) to prepare an environmental impact statement (EIS) on October 19, 1999 and proposed a two-part process. Part one would restrict certain activities, such as new road construction, in inventoried roadless areas. Part two would establish national direction for managing inventoried roadless areas, and for determining whether and to what extent similar protections should be extended to uninventoried roadless areas. Both part one and part two would be implemented with extensive public involvement. Part two would be implemented through local forest planning.

On December 20, 1999, the Forest Service concluded a comment period on the scope of the proposal. During this comment period, the agency hosted an unprecedented 190 regional and local public meetings and received more than 400,000 comments. On March 2, 2000 the USDA Forest Service Chief Mike Dombeck outlined details of the agency's proposed road management policy. The policy would rely upon scientific analysis and public involvement at the local level. It is designed to help the Forest Service determine how to best manage the more than 380,000 miles of roads in the national forest roads system.

The Forest Service is addressing how to best protect approximately 54 million acres of inventoried roadless areas. This inventory is based on Land and Resource Management Plans,

and other assessments completed and adopted by the Forest Service. The acreage identified within Alaska totals over 12 million acres.

The Forest Service published the Roadless Area Conservation Draft Environmental Impact Statement (DEIS) and Proposed Rule in May 2000. The release of the DEIS/proposed rule will be followed by a public comment period. Based on public input, the agency will develop a final rule and environmental impact statement.

The agency is proposing special consideration for the Tongass National Forest. On the Tongass, a decision to apply the prohibitions would be postponed until the 5-year Tongass Land and Resource Management Plan (TLMP) review. At that time, the forest supervisor would evaluate and determine whether the road construction and reconstruction prohibition should be applied to any or all of the unroaded portions of the Tongass inventoried roadless areas. The procedures that apply to all other national forests and grasslands would also apply to the Tongass.

Given the purpose and need, the deciding official must review the proposed action and the other alternatives in order to make three decisions regarding roadless area conservation:

- 1) Should road construction, reconstruction, and /or timber harvest be prohibited in the unroaded portions of inventoried roadless areas?
- 2) Should the agency establish direction for local managers to consider roadless characteristics in inventoried roadless areas and other unroaded areas during project or forest planning?
- 3) Should the proposed national prohibition or procedure be applied to the Tongass National Forest or modified to meet the unique situation on the Tongass?

The proposed action and preferred alternative would prohibit road construction and reconstruction within unroaded portions of inventoried roadless areas.

If the deciding official determines that the prohibition of road construction and reconstruction should not be applied to the Tongass National Forest in the same manner as they will be applied to the rest of the National Forest system, one of four unique alternatives designed for the Tongass National Forest would apply. The proposed action and preferred alternative is Alternative T3:

A decision to prohibit new roads in inventoried roadless areas would be postponed until April 2004. At that time, when the Tongass forest plan is reviewed, the Forest Supervisor would decide whether to prohibit road construction and reconstruction in any or all of the unroaded portions of inventoried roadless areas. If a decision is made to prohibit new roads, the public would be involved in any forest plan amendment or revision. During forest plan revision, local managers would evaluate the quality and importance of roadless characteristics in the unroaded portions of inventoried roadless and other unroaded areas and determine whether and how to protect them in the context of multiple-use objectives.

No prohibitions; determine whether road construction should be prohibited in unroaded portions of inventoried roadless areas as part of 5-year plan review; implement forest planning process at next plan revision.

At the time of the 5-year review of the April 1999 revised TLMP, the Forest Supervisor would determine whether the road construction and reconstruction prohibitions should apply to any or all of the unroaded portions of inventoried roadless areas on the Tongass National Forest. If it is determined that inventoried roadless areas on the Tongass merit protection by applying the road building prohibition, a forest plan amendment or revision would be initiated with full public involvement.

Effects of the Tongass National Forest Alternatives

Timber harvest on the Tongass National Forest occurs almost exclusively to promote growth and yield using even-aged (clear-cut) harvest methods and extensive road building. The result has been a decline in the amount of productive old growth in several intensively managed areas. About two-thirds of the Forest's planned timber volume offered in the next 5 years would be from inventoried roadless areas.

Under the current TLMP, the total projected timber offer within inventoried roadless areas on the Tongass in the next 5 years (fiscal years 2000 to 2004) is 539 MMBF, requiring 512 miles of road construction and reconstruction. At these timber offering levels, it is estimated that on the Tongass National Forest, 60 MMBF would likely be harvested per year from inventoried roadless areas.

At the national level, the proposed rule covers inventoried roadless areas within the Tongass National Forest in a special provision. That provision postpones a decision regarding protection of these areas until April 2004, and specifically notes that the decision would be subject to existing statutory direction uniquely applicable to the Tongass National Forest.

The Forest Service is proposing to delay consideration of protecting inventoried roadless areas for the Tongass National Forest until April 2004, in light of recent Forest Plan decisions that conserve roadless areas and a Southeast Alaska economy that is in transition. The 1999 decision administratively protected additional lands from road construction and extended harvest rotation in some areas, thus slowing the rate of road construction and harvest. Currently 82 percent of the Tongass National Forest's approximate 17 million acres is allocated for land use prescriptions that prohibit or limit road construction.

With the recent closure of pulp mills and the ending of long-term timber sales contracts, the timber economy of Southeast Alaska is transitioning to a competitive bid process. About two-thirds of the total timber harvest planned on the Tongass National Forest over the next 5 years is projected to come from inventoried roadless areas. If road construction is prohibited in inventoried roadless areas, approximately 95 percent of the timber harvest within those areas would be eliminated.

Under current circumstances, use of the Tongass National Forest's inventoried roadless areas for timber production contributes to the Forest Service's effort to seek to meet (within the meaning of section 101 of the Tongass Timber Reform Act) market demand for timber in the Tongass National Forest, consistent with providing for the multiple use and sustained yield of all renewable forest resources. However, with the continuing transition of the southeast Alaska timber market to an independent bid market, coupled with the long-term projected decline in timber demand for southeast Alaska timber, it is also possible that, by 2004 (when a review of the revised Tongass Land Management Plan is required), the long term demand for timber may be substantially reduced and market demand could be met consistent with protecting existing inventoried roadless areas.

Tongass National Forest Thinning Potential

TSS assessed the potential for utilizing precommercial thinnings from the Tongass National Forest and determined that it is uneconomic. Meetings with the Forest Service indicated that over the past ten years they have averaged 4,200 acres per year and that the average stand diameter was 2 – 3 inches. The current practice is that the Forest Service pays to have someone cut the material and leave it on the ground. The Forest Service recent thinning program is about 4,500 acres per year. In fiscal year 2000 the target is to thin less than 4,000 acres. They do not see any large increases in funding for this activity. TSS estimates that approximately 100,000 BDT of thinning residue is currently generated each year. Based on TSS's experience, it would be cost prohibitive to collect and process thinnings from the Tongass National Forest.

The Forest Service currently considers a 9 - inch diameter and larger tree to be of commercial size. At this time they do not know how many acres they have that are between this size and what they are currently thinning. A larger issue is the terrain that the small timber is growing on.

There are also areas of commercial thinning size second growth timber. However these first harvests on the Tongass National Forest were accomplished by yarding the timber directly to the water. These areas have been regenerated with second growth timber and would appear to be an excellent source of thinning material. However, the method of original logging did not provide for any road infrastructure. This is even more difficult now that there is a 1,000-foot no harvest buffer adjacent to the water. This allows for no economic way to harvest the second growth timber.

Primary Timber Types

The following Table 1.7 reflects the existing timber types for the Tongass National Forest and for Sealaska timberlands.

Table 1.7 Southeast Alaska Timber Types

Timber Types	Tongass National Forest	Sealaska Timberlands
Western Hemlock	60 %	54 %
Sitka Spruce	30 %	31 %
Cedar (red and yellow)	10 %	15 %
Total	100 %	100 %

BRITISH COLUMBIA WOOD RESIDUE

Skeena Cellulose

TSS met with E.S. Stu Taylor, General Manager of Skeena Cellulose and Kevin Carter, Fibre Supply Manager at their location to discuss the project and assess their wood residues in Prince Rupert, British Columbia.

The Skeena Cellulose facility has had an excess hog fuel supply for approximately 10 to 15 years, with the surplus accumulation of 650 green tons per day. This surplus is being placed in a large pile adjacent to their pulp mill on the island. TSS estimates that this pile contains in excess of 2 million tons.

The facility currently receives approximately 2,700 green tons per day of hog fuel. This material averages 48 to 50% MC as it comes from the interior of British Columbia. Skeena stated that approximately 140 BDT/day, or approximately 35,000 BDT could be available from local sources with little transportation costs. There would be some additional cost in handling to get the material loaded on barges in Porpoise Harbor. TSS estimates that this material could be acquired FOB barge for approximately \$5 to \$7/BDT. Transportation backhaul opportunities exist to

utilize backhauls to Alaska with barges that are now transporting pulp chips to Skeena. This volume could be backhauled to Klawock for a delivered cost of \$16.90/BDT. Additional hog fuel material is also available, but with higher transportation costs. TSS estimates that an additional 162,500 BDT per year is currently available delivered to Klawock for a cost of approximately \$27.50/BDT.

TSS also reviewed Skeena's yard on Ridley Island where pulp logs are received, run through a drum debarker and chipped. This operation is operated by one of their contractors. Skeena also brings in other logs that are merchandized for export, sawing or veneer. The operation generates significant volumes of bark and woody material from the drum debarker. This woody material would require some additional processing, as the size ranged from about 6 to 24 inches.

Canadian Forest Issues

Timber harvesting is regulated under the British Columbia Forestry Practices Code and Forest Renewal Act is intended to promote sustainable forest management in the Province. Revision of the Code during the past few years has resulted in unexpectedly higher harvesting costs. However, sixty percent of Canada's managed forests are expected to be certified for sustainable forest management by 2003, according to the Canadian Pulp and Paper association. The rate at which Canadian forestry companies are being certified is much faster than anticipated.

The seasonally adjusted annual rate of Canadian housing starts was 145,900 units in February, up 14 percent from January's rate and up 19 percent from February 1999. Canadian sawmills produced softwood lumber totaling a record 28.92 billion board feet in 1999, 5 percent higher than the previous high of 27.61 billion feet in 1998.

During 1999, Canada posted a 14 percent gain in total lumber exports to Japan as British Columbia producers fought hard to maintain their longstanding presence in Japan. Random Lengths reports that nearly every major Hemlock producer in the Coastal B.C. region has made some investment in new kiln-drying capacity in the past year. This is expected to help the region's industry maintain or even improve its share of the Japanese market.

FEEDSTOCK COMPOSITION

During the past year and a half, NREL analyzed several wood residue samples collected by Sealaska. Based upon a review of the various types of wood residue available from the above referenced sources for this project, TSS estimates that the chemical composition of the feedstock for the ethanol facility should approximate a blend of the following species and types of feedstocks that have been analyzed to date. Hog fuel consists of a mixture of sawdust and bark generated by sawmills in the production of lumber. The following Table 1.8 reflects TSS's estimate of the species mix of the feedstock for the proposed ethanol facility.

Table 1.8 Feedstock Composition

Feedstock Type	% by Type
Hemlock Hog Fuel	63%
Sitka Spruce Hog Fuel	27%
Red Cedar Hog Fuel	10%

There will be some variation in the feedstock. The feedstock plan for the facility reflects utilizing 50,000 BDT of hog fuel from local sawmills, 25,000 BDT of residue from local log sort yards and 25,000 BDT of hog fuel from sawmills near Prince Rupert, British Columbia. Many sawmill sources and log sort yard sources transport logs to their facilities by towing rather than by barging. This is an economic decision for them. The cost of barging logs is double the cost of towing. These sources will have some chloride contamination present from exposure to salt water. It is expected that the majority of this contamination will be in the bark. TSS estimates that 80 percent of the logs utilized by potential suppliers are currently transported in salt water at some point in their delivery to the processing facilities.

Log yard residues have not been sampled because none are currently being processed. Residues collected from log sort yards at the present time would be contaminated with rock and dirt. However, both Sealaska and Gateway plan to pave their log sort yards to be able to collect the residues without contamination from rock and dirt. It is anticipated that these residues will be processed to a specification that is acceptable to the ethanol facility.

EMISSION OFFSET CREDITS

Discussion with the State of Alaska Air Permits Staff in Juneau indicates that the areas considered for the ethanol facility are in attainment for air pollutants. The proposed facility at either site would not likely require emissions offset credits. Because of this, they do not have a protocol established for granting offset credits for utilizing wood material that is being disposed of by burning.

There are other areas in Alaska that are in nonattainment. The Anchorage urban area, as well as the Fairbanks and North Pole urban areas have been designated nonattainment areas for carbon monoxide. The Mendenhall Valley of Juneau and the Eagle River area of Anchorage have been designated nonattainment for PM-10.

USE OF LIGNIN BY PRODUCT

TSS has analyzed the potential use of lignin from the ethanol facility as fuel for an integrated power plant to generate steam and electricity. Based upon the analysis of feedstocks by NREL and the feedstock mix for this project, the average lignin content is approximately 36 percent. Assuming an annual feedstock consumption of 100,000 BDT by the ethanol facility, approximately 36,000 BDT of lignin would be generated annually.

The 36,000 BDT of lignin at an assumed heating value of 23,000 Mbtu/dry ton has an estimated annual heating value of 828 Billion Btu's. This volume of lignin fired in an integrated power plant with an assumed net heat rate of 19,000 Btu/kwh, has the potential to generate a total of 5.5 MW, or approximately 43,579 MWH on an annual basis.

FEEDSTOCK STORAGE

TSS recommends that the project carry additional inventory during the winter months to mitigate potential transportation delays. TSS has assumed that the proposed ethanol project will consume approximately 100,000 BDT on an annual basis. During non-winter months a one-month inventory, or approximately 8,500 BDT should be sufficient to provide a margin for delivery delays from the multiple sources. However, during winter months, TSS recommends increasing the inventory to approximately two to three-months supply. This would require a buildup of

wintertime inventory of approximately 17,000 to 25,000 BDT. TSS has assumed that the density of the feedstock in inventory will range from 15 to 17 dry pounds per cubic foot. TSS recommends that the surface of the feedstock storage area be paved to limit feedstock loss during storage. TSS also recommends the inventory pile be limited to a height of approximately 25 feet. Based upon these assumptions, TSS calculates the wintertime inventory will require a maximum storage area of approximately 3 acres.

TRANSPORTATION LOGISTICS

The primary means of transportation of feedstock to the facility will be by barge. Transportation costs will vary based upon the distance to the facility, (i.e. the amount of time required to transport the material from the source to the facility as well as the time to load and unload the barge) and the moisture content of the biomass feedstock, which will determine the average number of BDT's per load. Transportation costs were estimated for the two primary sites for the location of the ethanol facility. The primary site is Klawock and the secondary site is Ward Cove.

Upon initial investigation TSS found that the cost of transportation will be greater for the Klawock site. The majority of the feedstock available for this project is either available in the Ketchikan area or available through backhauls to this area utilizing chip barges that deliver pulp chips to Prince Rupert, BC or other pulp mill locations further south.

A significant portion of the cost of transportation of feedstock by barge occurs in the loading and unloading of the barge. Most of the sawmills do not have efficient loading systems. The exception to this is Viking in Klawock. The following Figure 1.12 reflects the barge loading system at Viking.

Figure 1.12



Transportation to Klawock also has some seasonal impacts. In general the route from Prince Rupert to Klawock through Dixon Entrance is more difficult, when weather is bad barges must take the northern route, which is 40 miles farther when delivering material from the Ketchikan area. During eight months of the year it is possible to barge south, however during four months in the winter, barges must use the northern route to avoid rough seas.

For purposes of this analysis, TSS assumed that biomass feedstock will be transported utilizing a barge can transport approximately 2,000 green tons of hog fuel material. Depending upon moisture content this can be the equivalent of 1,000 BDT of hog fuel if a 50 percent moisture content is assumed. It should be noted that various sizes of barges are in use in southeast Alaska. For example, Gateway and Silver Bay have barges with a capacity of approximately 1,000 BDT.

When the feedstock material is barged to the dock at either alternative site, an efficient barge unloading system will need to be designed and constructed as a part of the ethanol project. This additional infrastructure would be part of the ethanol project capital budget.

TSS worked with Boyer Alaska Barge Line in Ketchikan and Seattle to review the logistics of transporting this feedstock to the ethanol facility. Boyer has extensive experience transporting chips and hog fuel within the region. Boyer estimates that barge transportation costs for a tug and a 1,000 BDT capacity barge are currently \$5,000 per day. The use of a larger barge with a capacity of 2,500 BDT would cost approximately \$8,000 per day. TSS calculated the cost of feedstock transportation conservatively, assuming that all feedstock would be transported utilizing the smaller 1,000 BDT capacity barges.

The following Table 1.9 reflects the distances between the various feedstock supply sources and the potential ethanol plant sites.

Table 1.9 Southeast Alaska Barge Transportation Distances (miles)

Source	Klawock Site	Ward Cove Site
Gateway – Ward Cove	125 - 165	0
Seley – Ketchikan	125 – 165	5
Viking Lumber – Klawock	0	125 - 165
Whitestone – Hoona	183	218
Silver Bay – Wrangell	132	88
Skeena Cellulose – Prince Rupert	145	90

FEEDSTOCK AVAILABILITY AND PLAN

The following table reflects TSS's estimate of the total feedstock availability for the ethanol facility and a recommended feedstock plan. The plan takes a conservative approach by utilizing a mix of locally available sawmill and log sort yard residues as well as sawmill residue from Prince Rupert, British Columbia. While it appears the ethanol facility could be supplied by the available sawmill residues in Southeast Alaska, this plan provides for the possibility that the generation of

local sawmill residues may decrease if sawmills are not able to run at capacity because of log supply or decreased markets for their products.

Table 1.10 Estimated Feedstock Availability and Plan

Feedstock Source	Estimated Availability (BDT)	Recommended Plan (BDT)
Sealaska Timber Harvest and Thinning Residue	150,000 – 170,000	-0-
Tongass Timber Harvest and Thinning Residue	200,000	-0-
S.E. Alaska Sawmills	99,625 – 120,125	50,000
S.E. Alaska Log Sort Yards	32,500 – 37,500	25,000
B.C. Residue	35,000 – 197,500	25,000
Total	517,125 – 725,125	100,000

ESTIMATED FEEDSTOCK COST

TSS has made the following estimates of feedstock cost for this project. The recommended feedstock mix for both alternative ethanol facility locations provides for the use of available low cost sawmill residues, sort yard residues that currently requires disposal and a portion of the available sawmill residue in the Prince Rupert area that can economically be backhauled to Southeast Alaska. The following Table reflects this estimate of cost and recommended feedstock mix for the project for the primary site at Klawock. The recommended feedstock mix provides some spreading of the risk in supply by not utilizing the entire sawmill residue available locally.

Table 1.11 Estimated Feedstock Cost and Mix for Klawock Site

Feedstock Source	Estimated BDT/Year	Estimated Cost/BDT
Sawmill Residue	50,000	\$12.20
Sort Yard Residue	25,000	\$8.75
B.C. Sawmill Residue	25,000	\$16.90
Total	100,000	\$12.51

TSS also estimated the feedstock cost and feedstock mix for the secondary site in Ward Cove. The following Table reflects this estimate of cost and recommended feedstock mix for the project for the secondary site at Ward Cove.

Table 1.12 Estimated Feedstock Cost and Mix for Ward Cove Site

Feedstock Source	Estimated BDT/Year	Estimated Cost/BDT
Sawmill Residue	50,000	\$5.30
Sort Yard Residue	25,000	\$8.75
B.C. Sawmill Residue	25,000	\$14.90
Total	100,000	\$8.56

The following table reflects TSS's estimate of feedstock cost for the ethanol facility located at Klawock on a cost per gallon of ethanol produced basis. TSS has also reflected the potential impact on this cost from the utilization of the lignin by product as boiler fuel. TSS has assumed a \$10/BDT value for lignin. TSS has assumed that the ethanol facility will produce approximately 8 million gallons of ethanol annually from 100,000 BDT of feedstock.

Table 1.13 Estimated Range of Feedstock Costs for Ethanol Facility

Feedstock to Ethanol Facility	BDT	\$/BDT	Annual Cost	Cost/Gal
Woodwaste	100,000	\$12.50	\$1,250,000	\$0.16
Less \$10.00/BDT Value of Lignin as boiler fuel.	36,000	\$10.00	\$360,000	-\$0.04
Net Cost of Feedstock to Ethanol Facility	100,000		\$890,000	\$0.12

Surplus feedstock from the area and from the veneer plant can also be utilized in a boiler to generate electricity and steam for the ethanol facility.

Contracts With Suppliers

Sawmill owners and log sort yard operators currently face waste disposal issues and incur substantial costs of disposal. Because of this, the potential suppliers that TSS interviewed appear to be willing to enter into long-term contracts to deliver their waste to the ethanol facility. All of the potential suppliers within Southeast Alaska are also potential competitors for logs that Sealaska will need to

purchase from outside sources to supply the planned veneer plant. This will require careful analysis of the log supply for each facility within the region to identify opportunities for log purchases, sales and trades that will allow the ethanol facility to utilize the feedstock these sawmills and log sort yards generate.

Feedstock Supply Infrastructure

A major component of the feedstock supply infrastructure consists of existing tugs and barges that are currently transporting chips and hog fuel from Southeast Alaska to British Columbia and Washington. Based upon TSS's investigation there appears to be adequate barging infrastructure in place to deliver feedstock to the ethanol facility. The local barge company that TSS has worked with in this assessment, Boyer Alaska Barge Lines in Ketchikan, has indicated that they would be willing to enter into a long-term agreement with the ethanol facility.

There are some components of the supply infrastructure that need to be improved and/or created. A barge loading system needs to be installed at Skeena Cellulose to efficiently load barges for the return trip to Southeast Alaska. Improvements in barge loading at most of the sawmills are needed. The exception to this would be at Viking where barges are able to be efficiently loaded. An efficient barge unloading system needs to be incorporated in the design of the ethanol facility.

There is also some opportunity to improve the efficiency of transporting the feedstock by barge. As feedstock supply is firmed up from each supplier an assessment can be made of the most efficient size barges to use in each situation. Where larger capacity barges can be utilized, the ethanol facility can achieve a significant reduction in the cost of transportation and the ultimate cost of feedstock.

In addition, there currently is no infrastructure in place to process the log sort yard residues into usable feedstock. This will be a responsibility of the log sort yard operators. There may be an opportunity for either one of the log sort yard operators or a private contractor to develop a system to periodically process the residue that is generated.

Factors Influencing Biomass Feedstock Availability and Cost

Although there are presently considerable quantities of wood residue from sawmills and sort yards available in the supply area to be used as biomass feedstock, it is important to understand factors that

will influence the volumes and costs of biomass feedstock available. Some of the factors that will influence the biomass feedstock availability and cost are:

Weather - The weather will influence the seasonable availability of forest residue as feedstock. This area can have winter rain and snows. The weather will not influence the gross quantity available in the area; however, winter weather limits forest operations and can hamper barge transportation of biomass feedstock.

Wood Products Industry - The wood products industry in Alaska and Canada will influence the volume of biomass available from timber harvesting and sawmill operations. This industry has a cyclical history and during depressed times, mills may either reduce production or close.

Log Exports - The volume of logs exported from the region to the Pacific Rim directly impacts the amount of residues that are generated at log sort yards, as logs are merchandized to prepare them for market. These exports are affected by economic conditions throughout the world and by developments in other log exporting countries such as Russia, Malaysia, Indonesia, Papua New Guinea, New Zealand, Chile and Europe.

Governmental Action - Certain governmental action such as further reductions of timber harvest on the Tongass National Forest or more environmental regulations by the State or Federal governments could influence the volume of commercial timber available for harvesting; funding for public forest management and thinning and changes in logging practices; all of which could influence the volume and cost of feedstock available from forest industry related sources for new biomass to ethanol facility.

RISKS

Feedstock Risks

- Increased Federal and State environmental regulation could further limit timber harvest on Federal and private lands, reducing the availability of residue generated from sawmills and log sort yards in Southeast Alaska.
- Transportation is the major component of feedstock cost for this project. Increases in the cost of fuel can impact the effective costs of feedstock.
- There is a risk that the amount of chloride present in a portion of the feedstock will cause problems with the ethanol process.
- Unforeseen competition for the planned feedstock in the future could increase feedstock costs.

Ethanol Risks

- The future availability of federal and state subsidies for ethanol is key to the economic viability of this project. The federal subsidy is currently 54 cents-per-gallon and begins to decline in 2001 and continue until 2005 when the subsidy drops to 51 cents-per-gallon, then is scheduled to expire in 2007. The State subsidy in Alaska is currently 80 cents-per-gallon for ethanol and is scheduled to expire in 2004.
- The federal subsidies for fuel containing 10 percent ethanol by volume is currently 5.4 cents-per-gallon and begins to decline in 2001 and continue until 2005 when the subsidy drops to 5.1 cents. The Alaska subsidy for fuel containing 10 percent ethanol by volume is 8 cents-per-gallon.

- Changes in these subsidies could have a dramatic impact on the viability of proposed biomass to ethanol projects.

RECOMMENDATIONS

- During the next phase, (September, 2000 - September, 2001), Letters of Intent and/or contracts with potential feedstock suppliers and transportation companies should be negotiated.
- Conduct additional feedstock sampling for all potential sources to determine the extent and impact of chloride.
- Continue to monitor and provide input to the Tongass National Forest regarding the Roadless Area Conservation Draft Environmental Impact Statement.
- Provide input to the Tongass National Forest regarding the extent of additional market demand for national forest timber by the planned veneer and ethanol facilities.